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Lysozyme in water-acetone mixtures: Residual enzyme activity and preferential solvation

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Abstract

 Numerous benefits of employing enzymes in non-aqueous organic liquids exist, including catalysis of industrially-important synthetic reactions, suppression of undesirable side reactions caused by water, and high solubility of hydrophobic reagents. Residual enzyme activity was investigated to monitor stabilization/destabilization of hen egg-white lysozyme at low, intermediate, and high water content in acetone at 25oC. The advantages of our methods are as follows: 1. Residual enzyme activity curves can be determined in the entire range of water content in organic liquids. 2. Enzyme activity values can be measured at fixed reaction conditions. 3. Information about changes in the state of the catalytically-active sites can be obtained separately from other contributions (e.g., changes in the solvation of reagents and products in water - organic mixtures). Our results clearly demonstrate that the stabilization/destabilization of lysozyme depends significantly on water content in acetone. 1. At high water content, residual activity values are close to 100%. 2. A minimum on the residual activity curve was observed at intermediate water content. Acetone augments the irreversible inactivation of lysozyme in this region. 3. Lysozyme demonstrates significant residual activity in water-poor acetone.

Keywords

Acetone, Biocatalysis in water-organic mixtures, Enzyme activity, Lysozyme, Preferential solvation, Protein stability

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